10-4
Common Logs

(applications)

ex

Evaluate $\log_2 9 = y = \frac{\log 9}{\log 2}$

$2^y = 9$

$y \log 2 = \log 9$

$y = \frac{\log 9}{\log 2}$

Cannot do on calc because base of 2

Change of Base Formula

$\log_a n = \frac{\log_b n}{\log_b a}$

$n > 0$
$a > 0$
$b > 0$
$b \neq 1$
$a \neq 1$

ex

$\log_4 7 = \frac{\log 7}{\log 4}$

$= 1.404$

ex

$\log_3 5 = \frac{\log 5}{\log 3} = 1.465$

The common logs are used in:
- the richter scale
- pH levels
- decibals of sound

$R = 10 \log \frac{I_0}{I_0}$

$10 \log 1 = 0$

$R = 10 \log (\text{times as loud as threshold of hearing})$

$R = 10 \log \frac{300 I_0}{I_0}$

$= 10 \log 300$

$R = 24.8 \text{ dB}$

2. $\frac{70}{10} = \frac{10 \cdot \log X}{10}$

$7 = \log X$

$10^7 = X$

10^7 times as loud as the I_0

8. $pH = -\log[5 \times 10^{-2}]$ (5×10^{-2})

$-\log[5E-2]$

$pH = 1.30$

11. $\log E = 11.8 + 1.5M$

$\log(8 \times 10^{19}) = 11.8 + 1.5M$

$19.903 = 11.8 + 1.5M$

$5.40 = M$